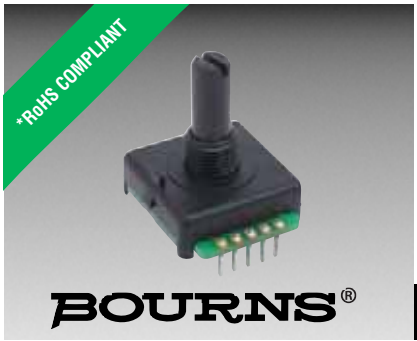


Features

- Absolute encoder / absolute code output
- Digital output
- Sturdy construction
- Bushing mount
- Available with PC board mounting bracket (optional)
- *RoHS compliant

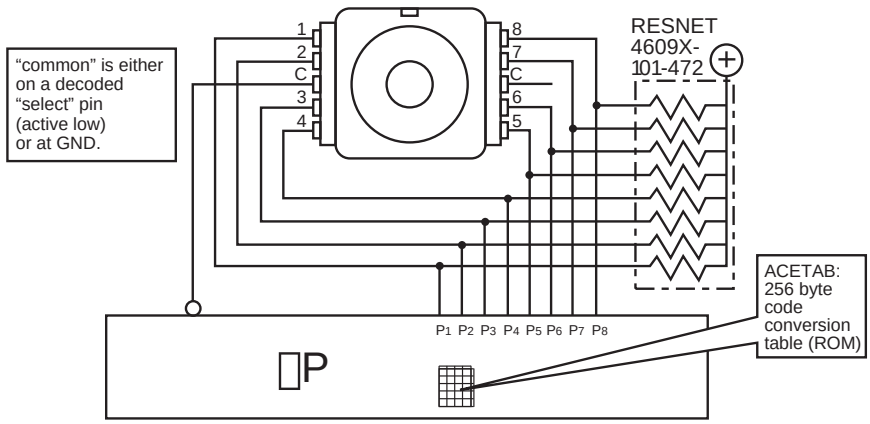
EAW - Absolute Contacting Encoder (ACE™)

General Information

Until now, the choice of an absolute encoder meant an expensive, and larger-sized product. Through the use of combinatorial mathematics, the absolute code pattern of the Bourns® Absolute Contacting Encoder (ACE™) is placed on a single track for a very economical, energy-efficient and compact product. Bourns® ACE™ provides an absolute digital output that will also retain its last position in the event of a power failure.

An intelligent alternative to incremental encoders and potentiometers, the Bourns® ACE™ is ideally suited for many industrial, medical and consumer product applications.

Recommended Control Diagram for ACE-128



Electrical Characteristics

Output	8-bit code with 128 absolute states
Closed Circuit Resistance	5 ohms maximum
Open Circuit Resistance	100 K ohms minimum
Contact Rating	10 milliamp @ 10 VDC or 0.1 watt maximum
Insulation Resistance (500 VDC)	1,000 megohms minimum
Dielectric Withstanding Voltage (MIL-STD-202 Method 301)	
Sea Level	1,000 VAC minimum
Electrical Travel	Continuous
Contact Bounce (60 RPM)	2.7 milliseconds maximum*
RPM (Operating)	120 maximum

Environmental Characteristics

Operating Temperature Range	-40 ºC to +85 ºC (-40 °F to +185 °F)
Storage Temperature Range	-40 ºC to +85 ºC (-40 °F to +185 °F)
Humidity	MIL-STD-202, Method 103B, Condition B
Vibration	15 G
Contact Bounce	0.1 millisecond maximum
Shock	50 G
Contact Bounce	0.1 millisecond maximum
Rotational Life	50,000 shaft revolutions minimum
IP Rating	IP 40

Mechanical Characteristics

Mechanical Angle	360 ° Continuous
Running Torque	0.5 to 1.5 N-cm (0.75 to 2.50 oz-in.)
Mounting Torque	79 N-cm (7 lb.-in.) maximum
Shaft Side Load (Static)	4.5 kg (10 lbs.) minimum
Weight	Approximately 14 gms. (0.50 oz.)
Terminals	Printed circuit board terminals
Soldering Condition	
Manual Soldering	96.5Sn/3.0Ag/0.5Cu solid wire or no-clean rosin cored wire 370 °C (700 °F) max. for 3 seconds
Wave Soldering	96.5Sn/3.0Ag/0.5Cu solder with no-clean ux 260 °C (500 °F) max. for 5 seconds
Wash processes	Not recommended
Marking	Manufacturer's name and trademark, part number, and date code.
Hardware	One lockwasher and one mounting nut are shipped with each encoder, except where noted in the part number.
Packaging	45 pcs./tray

*High probability of missing quadrature codes with maximum bounce.

WARNING Cancer and Reproductive Harm
www.P65Warnings.ca.gov

*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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Pin Output Code For ACE-128

Bit/Pin correlation: b7 b6 b5 b4 b3 b2 b1 b0 = p8 p7 p6 p5 p4 p3 p2 p1
A binary “1” denotes an “open” switch and a binary “0” denotes a “closed” switch.
Positions 0-127 are seen by a clockwise rotation of the shaft.

Position	p8	p7	p6	p5	p4	p3	p2	p1	Decimal Output
0	0	1	1	1	1	1	1	1	127
1	0	0	1	1	1	1	1	1	63
2	0	0	1	1	1	1	1	0	62
3	0	0	1	1	1	0	1	0	58
4	0	0	1	1	1	0	0	0	56
5	1	0	1	1	1	0	0	0	184
6	1	0	0	1	1	0	0	0	152
7	0	0	0	1	1	0	0	0	24
8	0	0	0	0	1	0	0	0	8
9	0	1	0	0	1	0	0	0	72
10	0	1	0	0	1	0	0	1	73
11	0	1	0	0	1	1	0	1	77
12	0	1	0	0	1	1	1	1	79
13	0	0	0	0	1	1	1	1	15
14	0	0	1	0	1	1	1	1	47
15	1	0	1	0	1	1	1	1	175
16	1	0	1	1	1	1	1	1	191
17	1	0	0	1	1	1	1	1	159
18	0	0	0	1	1	1	1	1	31
19	0	0	0	1	1	1	0	1	29
20	0	0	0	1	1	1	0	0	28
21	0	1	0	1	1	1	0	0	92
22	0	1	0	0	1	1	0	0	76
23	0	0	0	0	1	1	0	0	12
24	0	0	0	0	0	1	0	0	4
25	0	0	1	0	0	1	0	0	36
26	1	0	1	0	0	1	0	0	164
27	1	0	1	0	0	1	1	0	166
28	1	0	1	0	0	1	1	1	167
29	1	0	0	0	0	1	1	1	135
30	1	0	0	1	0	1	1	1	151
31	1	1	0	1	0	1	1	1	215
32	1	1	0	1	1	1	1	1	223
33	1	1	0	0	1	1	1	1	207
34	1	0	0	0	1	1	1	1	143
35	1	0	0	0	1	1	1	0	142
36	0	0	0	0	1	1	1	0	14
37	0	0	1	0	1	1	1	0	46
38	0	0	1	0	0	1	1	0	38
39	0	0	0	0	0	1	1	0	6
40	0	0	0	0	0	0	1	0	2
41	0	0	0	1	0	0	1	0	18
42	0	1	0	1	0	0	1	0	82
43	0	1	0	1	0	0	1	1	83
44	1	1	0	1	0	0	1	1	211
45	1	1	0	0	0	0	1	1	195
46	1	1	0	0	1	0	1	1	203
47	1	1	1	0	1	0	1	1	235
48	1	1	1	0	1	1	1	1	239
49	1	1	1	0	0	1	1	1	231
50	1	1	0	0	0	1	1	1	199
51	0	1	0	0	0	1	1	1	71
52	0	0	0	0	0	1	1	1	7
53	0	0	0	1	0	1	1	1	23
54	0	0	0	1	0	0	1	1	19
55	0	0	0	0	0	0	1	1	3
56	0	0	0	0	0	0	0	1	1
57	0	0	0	0	1	0	0	1	9
58	0	0	1	0	1	0	0	1	41
59	1	0	1	0	1	0	0	1	169
60	1	1	1	0	1	0	0	1	233
61	1	1	1	0	0	0	0	1	225
62	1	1	1	0	0	1	0	1	229
63	1	1	1	1	0	1	0	1	245

Position	p8	p7	p6	p5	p4	p3	p2	p1	Decimal Output
64	1	1	1	1	0	1	1	1	247
65	1	1	1	1	0	0	1	1	243
66	1	1	1	0	0	0	1	1	227
67	1	0	1	0	0	0	1	1	163
68	1	0	0	0	0	0	1	1	131
69	1	0	0	0	1	0	1	1	139
70	1	0	0	0	1	0	0	1	137
71	1	0	0	0	0	0	0	1	129
72	1	0	0	0	0	0	0	0	128
73	1	0	0	0	0	1	0	0	132
74	1	0	0	1	0	1	0	0	148
75	1	1	0	1	0	1	0	0	212
76	1	1	1	1	0	1	0	0	244
77	1	1	1	1	0	0	0	0	240
78	1	1	1	1	0	0	1	0	242
79	1	1	1	1	1	0	1	0	250
80	1	1	1	1	1	0	1	1	251
81	1	1	1	1	1	0	0	1	249
82	1	1	1	1	0	0	0	1	241
83	1	1	0	1	0	0	0	1	209
84	1	1	0	0	0	0	0	1	193
85	1	1	0	0	0	1	0	1	197
86	1	1	0	0	0	1	0	0	196
87	1	1	0	0	0	0	0	0	192
88	0	1	0	0	0	0	0	0	64
89	0	1	0	0	0	0	1	0	66
90	0	1	0	0	1	0	1	0	74
91	0	1	1	0	1	0	1	0	106
92	0	1	1	1	1	0	1	0	122
93	0	1	1	1	1	0	0	0	120
94	0	1	1	1	1	0	0	1	121
95	0	1	1	1	1	1	0	1	125
96	1	1	1	1	1	1	0	1	253
97	1	1	1	1	1	1	0	0	252
98	1	1	1	1	1	0	0	0	248
99	1	1	1	0	1	0	0	0	232
100	1	1	1	0	0	0	0	0	224
101	1	1	1	0	0	0	1	0	226
102	0	1	1	0	0	0	1	0	98
103	0	1	1	0	0	0	0	0	96
104	0	0	1	0	0	0	0	0	32
105	0	0	1	0	0	0	0	1	33
106	0	0	1	0	0	1	0	1	37
107	0	0	1	1	0	1	0	1	53
108	0	0	1	1	1	1	0	1	61
109	0	0	1	1	1	1	0	0	60
110	1	0	1	1	1	1	0	0	188
111	1	0	1	1	1	1	1	0	190
112	1	1	1	1	1	1	1	0	254
113	0	1	1	1	1	1	1	0	126
114	0	1	1	1	1	1	0	0	124
115	0	1	1	1	0	1	0	0	116
116	0	1	1	1	0	0	0	0	112
117	0	1	1	1	0	0	0	1	113
118	0	0	1	1	0	0	0	1	49
119	0	0	1	1	0	0	0	0	48
120	0	0	0	1	0	0	0	0	16
121	1	0	0	1	0	0	0	0	144
122	1	0	0	1	0	0	1	0	146
123	1	0	0	1	1	0	1	0	154
124	1	0	0	1	1	1	1	0	158
125	0	0	0	1	1	1	1	0	30
126	0	1	0	1	1	1	1	0	94
127	0	1	0	1	1	1	1	1	95

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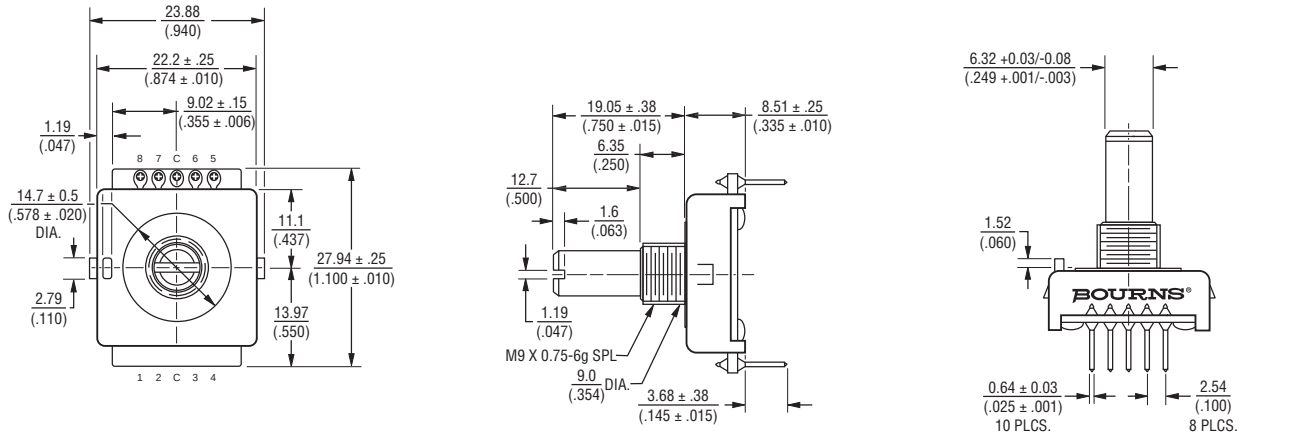
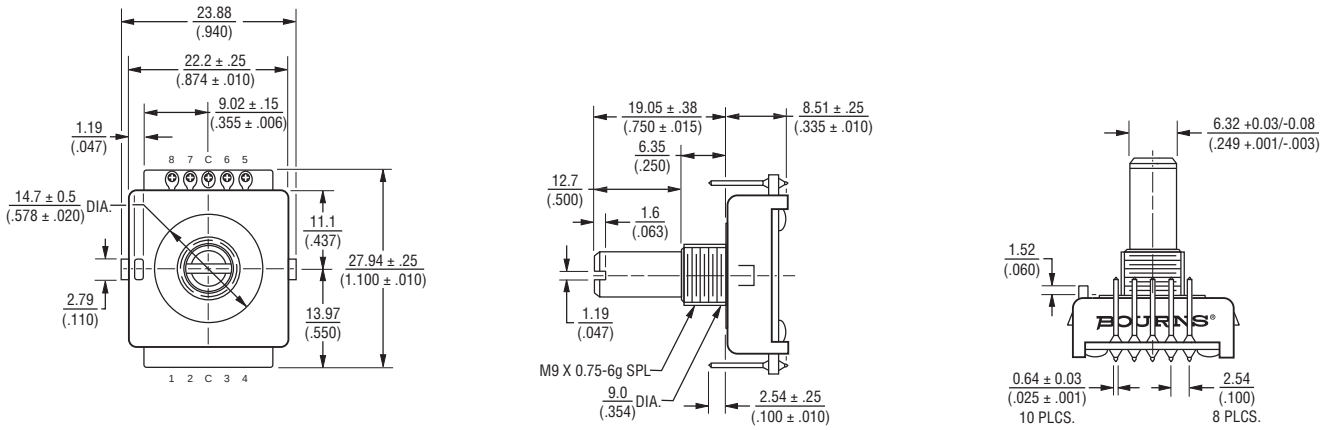
Dimensional Drawings

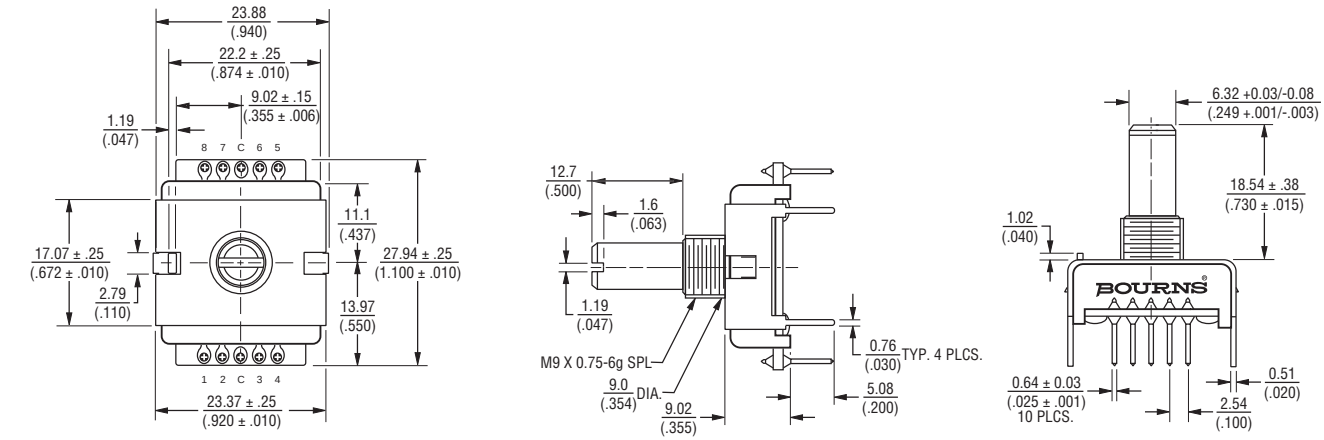
Bushing Mounted: Housing A with Rear Facing Terminals



Bushing Mounted: Housing A with Forward Facing Terminals



PCB Bracket Mounted: Housing B



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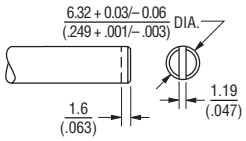
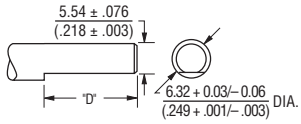
Dimensional Drawings

Shaft Style **B**

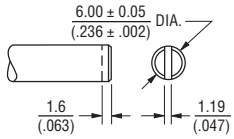


Shaft Style **C**



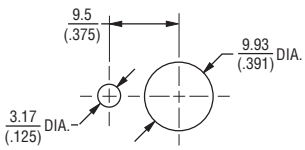
"D" DIMENSION EXTENDS FROM SHAFT END TO BUSHING FACE
"D" = (SHAFT LENGTH, FMS) – (BUSHING LENGTH)

Shaft Style **R**

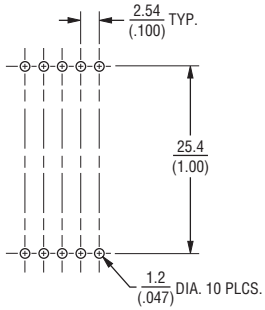


Bushing Mounted: Housing A with Rear Facing Terminals

Panel Hole Dimensions

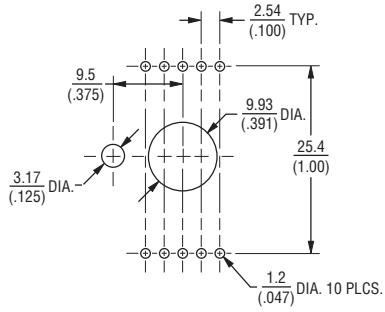


PCB Board Hole Pattern w/PCB Bracket



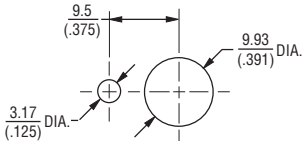
Bushing Mounted: Housing A with Forward Facing Terminals

PCB Board Hole Pattern w/PCB Bracket

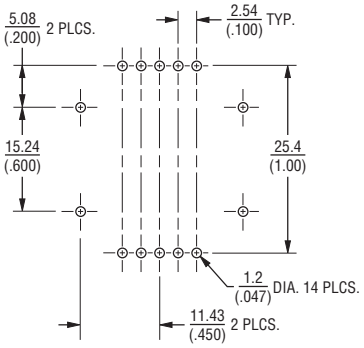


PCB Bracket Mounted: Housing B

Panel Hole Dimensions



PCB Board Hole Pattern w/PCB Bracket



TOLERANCES EXCEPT WHERE NOTED:

.XX = ± .51 (.02) .XXX = ± .127 (.005)

DIMENSIONS: MM (IN)

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EAW - Absolute Contacting Encoder (ACE™)

BOURNS®

How to Order

PART NUMBERING SYSTEM

E	A	W	0	J	-	B	2	4	-	A	E	0	1	2	8	L

Code	Rotational Life
A	50,000 Revolutions

BUSHING CONFIGURATION	
Code	**Description**
W	9 mm x 1/4 ″ Length. Threaded M9x0.75
L	9 mm x 3/8 ″ Length. Threaded M9x0.75 (Use B shaft only.)

DETENT CONFIGURATION	
Code	**Description**
0	Non-Detented

ANTI-ROTATION LUG POSITION	
Code	**Description**
J	9:00 Position
D	None

SHAFT STYLE (See Outline Drawing for Details)	
Code	**Description**
B	Plain with Inserted Slot (1/4 ″ Dia.)
C	Single Flatted (1/4 ″ Dia.)
R	Plain with Inserted Slot (6 mm Dia.)

RoHS IDENTIFIER	
Code	**Description**
L	Compliant

PERFORMANCE CODE		
Code	**Detents**	**States/Rev.**
E0128	0	128

HOUSING TERMINAL CONFIGURATION (X indicates "Equipped With")					
	Code				
Features	**A**	**B**	**C**	**H**	**K**
Rear Mount Terminals	X	X	X		
Forward Facing Terminals				X	X
PCB Bracket		X	X		
Hardware Included	X		X	X	

SHAFT LENGTH (FMS)		
Code	**Description**	**Available Shaft Styles**
24	3/4 ″ (19.05 mm) Length	B, C
	Metric	
19	19 mm Length	R

The sample part number demonstrates the identification code for Bourns contacting encoders.
The part number shown is a commonly used model, typically available from stock.

**Consult factory concerning special inquiries.*

REV. 09/19

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Unless Bourns has explicitly designated an individual Bourns® product as meeting the requirements of a particular industry standard (e.g., IATF 16949) or a particular qualification (e.g., UL listed or recognized), Bourns is not responsible for any failure of an individual Bourns® product to meet the requirements of such industry standard or particular qualification even if such industry standard or qualification is a "state of art". Users of Bourns® products are responsible for ensuring compliance with safety-related requirements and standards applicable to their devices or applications.

Bourns® products are not recommended, authorized or intended for use in applications where failure or malfunction may result in personal injury, death, or severe property or environmental damage, such as without limitation nuclear, life-critical medical and certain automotive and aviation applications. Except as set forth in the bullet points below or unless expressly and specifically approved in writing on a case-by-case basis by an authorized Bourns' representative, use of any Bourns® products in such unauthorized high-risk applications is at the user's sole risk.

- Bourns considers implantable/invasive devices and devices/procedures designed as life-supporting or life-sustaining by the U.S. Food and Drug Administration or equivalent organizations outside of the United States as "life-critical" medical applications. Bourns expressly identifies those Bourns® standard products that are suitable for use in typical medical applications that are not life-critical in its publication entitled "Bourns Medical Grade Component Guide."

- Bourns expressly identifies those Bourns® standard products that are suitable for use in typical automotive applications associated with any Automate Safety Integrity Level (ASIL) in its publication entitled "Bourns Automotive Grade Component Guide." Bourns' designation of Bourns® product as compliant with the AEC-Q standard does not by itself mean that Bourns has approved such product for use in an automotive application.

- Bourns expressly identifies Bourns® standard products that are suitable for use in the typical aviation applications/systems requiring System Design Assurance Level (RTCA DO-254 DAL) of C, D or E in its publication entitled "Bourns Civilian Aerospace/Aviation Grade Component Guide." Bourns does not test its products for compliance with United States Federal Aviation Administration standards or any other generally equivalent governmental organization standard applicable to products designed or manufactured for use in aviation applications. Use of Bourns® standard components in aviation applications associated with RTCA DO-254 DAL A or B without proper approval noted above shall be at the user's sole risk.

- Bourns will review and authorize on a case-by-case basis the use of Bourns® standard products which are at least AEC-Q compliant in space-related civil applications (rockets, satellites) with a negotiated cross-waiver and indemnity agreement.

The use and level of testing applicable to Bourns® custom products shall be negotiated on a case-by-case basis by Bourns and the user for which such Bourns® custom products are specially designed. Absent a written agreement between Bourns and the user regarding the use and level of such testing, the above provisions applicable to Bourns® standard products shall also apply to such Bourns® custom products.

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